

CLAIMS:

1. A polymer made of (i) at least one non-brominated monomer and (ii) at least one brominated monomer having the structure A-B-C, wherein A is a phenyl, substituted with 3-5 bromine atoms, B is a C₁ to C₄ alkyl, optionally substituted with 1 to 8 bromine atoms, and C is an acrylic or methacrylic group, said polymer being characterized in having bromine contents of 20%(w/w) or more.
2. A polymer according to claim 1, wherein said phenyl is substituted with 5 bromine atoms.
3. A polymer according to claim 1, wherein said alkyl is CH₂.
4. A polymer according to claim 1, wherein said acrylic group is acrylate.
5. A polymer according to claim 1, wherein said brominated monomer is penta bromo benzyl acrylate (PBBMA).
6. A polymer according to claim 1 wherein said bromine contents is 60-70%.
7. A polymer according to claim 1, wherein said bromine content is 25 – 50%.
8. A polymer according to claim 1, wherein said bromine content is 20 – 35%.
9. A polymer according to any one of the preceding claims, having a non-brominated monomer that is a specialty monomer.
10. A polymer according to the preceding claim, wherein said specialty monomer is selected from monomers that are cross-linking, surface active, and/or adhesion promoting.
11. A polymer according to claim 9 wherein said specialty monomer is selected from sodium salt of 2-acrylamido-2-methyl propane sulphonic acid, betal-carboxymethyl acrylate, ammonium allyloxypolyethoxy(10)sulphate, laurethoxy(23)methacrylate, laurethoxy(25)methacrylate, allyl methacrylate, and hydroxyl ethyl methacrylate, glycidyl methacrylate, ammonium salt of α -sulfo- ω -[1-(Alkoxy)methyl-2-(2-propenyloxy)ethoxy]- ω -hydro-poly(oxy-1,2,-ethanediyl), ammonium salt of α -[1-(Alkoxy)methyl-2-(2-propenyloxy)ethoxy]- ω -hydro-poly(oxy-1,2,-ethanediyl), ditrimethylo propane tetraacrylate, ethoxilated trimetholopropabe triacrylate, and trimethylo propabe acrylate.

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12. A polymer according to any one of claims 1 to 8, having a non-brominated monomer selected from the group consisting of acrylic monomers, vinyl acetate and styrene or a styrene derivative.
13. A polymer according to the preceding claim, wherein said acrylic monomer is selected from acrylamide, acrylic acid, acrylonitrile, butyl acrylate, ethyl acrylate, 2-ethyl hexyl acrylate, and methyl methacrylate.
14. A polymer according to any one of claims 1-8, having a non-brominated monomer of the formula $R_1CH=CR_2C(O)A$, wherein
- A is selected from the group consisting of OR_3 , NR_3R_4 , and CN; and
- R_1 and R_2 are each independently selected from H and alkyl, said alkyl being linear or branched, and each of R_3 and R_4 independently may be H, alkyl, alkenyl, alkoxy, polyalkoxy, alkanol, or ether, each of which may be linear or branched, substituted or unsubstituted.
15. A polymer according to the preceding claim, wherein the carbon-containing R groups have between 1 and 15 carbons.
16. A polymer according to the preceding claim, wherein the alkyl groups have between 1 and 4 carbon atoms.
17. A polymer according to any one of the preceding claims, having a Tg of less than 0°C.
18. A mixture comprising a polymer according to any one of the preceding claims and more than one surface active agent.
19. A mixture according to the preceding claim, further containing antimony oxide.
20. An aqueous dispersion comprising a polymer made of a bromine-containing monomer having the structure A-B-C, wherein A is a phenyl, substituted with 3-5 bromine atoms, B is a C_1 to C_4 alkyl, optionally substituted with one to 8 bromine atoms, and C is an acrylic or methacrylic group and at least one non-brominated monomer, characterized in that said dispersion has a solid content of at least 40%.
21. An aqueous dispersion according to claim 20, wherein said phenyl is substituted with 5 bromine atoms.
22. An aqueous dispersion according to claim 20 or 21 wherein said alkyl is CH_2 .

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23. An aqueous dispersion according to claim 20 wherein said brominated monomer is PBBMA.
24. An aqueous dispersion according to claim 20, wherein said polymer is according to any one of claims 1 to 17.
25. An aqueous dispersion according to any one of claims 20 to 24, further comprising at least two different surface active agents.
26. An aqueous dispersion according to the preceding claim, wherein one or more of said surface active agents is an alkyl aryl.
27. An aqueous dispersion according to any one of claims 20 to 26, further containing antimony oxide.
28. An aqueous dispersion according to any one of claims 20 to 27, consisting essentially of solid particles in aqueous solution, wherein the size of said solid particles is less than 2000nm.
29. An aqueous dispersion according to the preceding claim, wherein said size is between 50 and 1000nm.
30. An aqueous dispersion according to the preceding claim, wherein said size is between 80 and 400nm.
31. An aqueous dispersion according to any one of claims 20 to 30, wherein said polymer has a density of 1.2g/cc or more.
32. An aqueous dispersion according to any one of claims 19 to 30, wherein said polymer has a molecular weight of 500,000 and above.
33. An aqueous dispersion according to the preceding claim, wherein said polymer has a molecular weight of 1,000,000 or above.
34. An aqueous dispersion according to any one of claims 20 to 33, which is stable for at least six months in -7-35°C with no direct sunlight.
35. An aqueous dispersion according to any one of claims 20 to 33, which is stable for at least six months in 5 to 35°C with no direct sunlight.
36. A product comprising antimony oxide and a polymer made of at least one bromine-containing monomer and at least one non-brominated monomer, wherein said product is fire-retardant.

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37. A product according to claim 36, wherein said polymer is according to any one of claims 1 to 17.

38. A product according to claim 36 or 37, comprising a textile, said textile being printed, sprayed, or impregnated with an aqueous dispersion according to any one of claims 27-35.

39. A product according to claim 38, wherein said non-brominated monomer is hydrophobic.

40. A product according to claim 39, wherein said hydrophobic monomer is selected from the group consisting of butyl Acrylate, 2-ethyl hexyl acrylate, styrene, and styrene derivatives.

41. A method for fabricating a fire-retardant textile, comprising printing, spraying or impregnating a textile with an aqueous dispersion, which is according to any one of claims 20-35.

42. A method for improving the hydrophobicity of a textile, comprising printing, spraying, or impregnating said textile with an aqueous dispersion according to any one of claims 20 to 35.

43. A method according to the preceding claim, wherein the polymer dispersed in said dispersion includes a hydrophobic non-brominated monomer.

44. A method according to claim 41, wherein said hydrophobic non-brominated monomer is selected from the group consisting of butyl Acrylate, 2-ethyl hexyl acrylate, and styrene.

45. A method for obtaining an aqueous dispersion of a co-polymer containing at least a first monomer and a second monomer, wherein said second monomer is at least partially dissolved in said first monomer, and reacts to polymerize therewith in the presence of water and surfactants; said method being characterized in that said first monomer is a brominated aromatic compound.

46. A method according to the preceding claim, wherein said brominated aromatic compound has the structure A-B-C, wherein A is a phenyl, substituted with 3-5 bromine atoms, B is a C₁ to C₄ alkyl, optionally substituted with one to 8 bromine atoms, and C is an acrylic or methacrylic group.

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47. A method according to claim 45 or 46 wherein the phenyl in said first monomer is substituted with 5 bromine atoms.
48. A method according to claim 45 or 46, wherein the alkyl in said first monomer is CH_2 .
49. A method according to the preceding claim, wherein said first monomer is PBBMA.
50. A method according to claim 45, wherein said first monomer is a bromostyrene or a derivative thereof.
51. A method according to any one of claims 45 to 50, wherein said second monomer is styrene or a styrene derivative.
52. A method according to any one of claims 45 to 51 wherein the amount of said water is such that the obtained dispersion has at least 40% solid content.
53. A method according to any one of claims 45 to 52, wherein the ratio between said first monomer and non-brominated monomers is such that the obtained polymer has at least 20%(w/w) bromine content.
54. A method according to any one of claims 45 to 53, wherein at least one of said surfactants is reactive, and the obtained polymer contains said first monomer, said second monomer, and said reactive surfactant.
55. A method according to any one of claims 45 to 54, wherein said first and second monomer react with at least one other monomer, such that the polymer obtained by the method is of said first monomer, said second monomer, and said at least one other monomer.
56. A method according to the preceding claim, wherein said at least one other monomer is a specialty monomer.
57. A method according to the preceding claim, wherein said specialty monomer is selected from monomers that are cross-linking, surface active, and adhesion promoting.
58. A method according to claim 56 or 57 wherein said specialty monomer is selected from the group consisting of N-(Hydroxymethyl)acrylamide, sodium salt of 2-acrylamido-2-methyl propane sulphonic acid, betal-carboxymethyl acrylate,

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ammonium allyloxypolyethoxy(10)sulphate, laurethoxy(23)methacrylate, laurethoxy(25)methacrylate, allyl methacrylate, and hydroxyl ethyl methacrylate, glycidyl methacrylate, ammonium salt of α -sulfo- ω -[1-(Alkoxy)methyl-2-(2-propenyloxy)ethoxy]- ω -hydro-poly(oxy-1,2,-ethanediyl), ammonium salt of α -[1-(Alkoxy)methyl-2-(2-propenyloxy)ethoxy]- ω -hydro-poly(oxy-1,2,-ethanediyl).

59. A method according to claim 55, wherein said at least one other monomer is selected from the group consisting of acrylic monomers and vinyl acetate.

60. A method according to the preceding claim, wherein said acrylic monomer is selected from the group consisting of acrylamide, acrylic acid, acrylonitrile, butyl acrylate, ethyl acrylate, 2-ethyl hexyl acrylate, and methyl methacrylate.

61. A method according to claim 55, wherein said at least one other monomer is of the formula $R_1CH=CR_2C(O)A$, wherein

A is selected from the group consisting of OR_3 , NR_{3R4} , and CN; and

R_1 and R_2 are each independently selected from H and alkyl, said alkyl being linear or branched, and each of R_3 and R_4 independently may be H, alkyl, alkenyl, alkoxy, polyalkoxy, alkanol, or ether, each of which may be linear or branched, substituted or unsubstituted.

62. A method according to the preceding claim, wherein the carbon-containing R groups have between 1 and 15 carbons.

63. A method according to the preceding claim, wherein the alkyl groups have between 1 and 4 carbon atoms.

64. A method according to any one of claims 45 to 63, comprising:

- (i) dissolving said first monomer in a first liquid to obtain a solution, wherein said first liquid includes said second monomer optionally together with surfactants;
- (ii) mixing said solution with water and optionally also with surfactants to obtain a stable emulsion comprising water, surfactants, and said first monomer; and

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- (iii) reacting said stable emulsion with an initiator to obtain an aqueous dispersion of a co-polymer containing at least said first monomer and said second monomer.

65. A method according to the preceding claim, wherein said first liquid does not include surfactants and in (ii) said solution is mixed with water and surfactants.